CHOLERA MALIGNA

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A SPECIFIC ACUTE INFLAMMATION

OF THE

MUCOUS TISSUE OF THE SMALL INTESTINE

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"The effect of full doses of Tartar-emetic in restraining active inflammations of mucous tissues, well ascertained."—*Sir Thomas Watson, Bart.*

BY

GEORGE BARNARD,
MEMBER OF THE ROYAL COLLEGE OF SURGEONS OF ENGLAND;
STAFF SURGEON, EASTERN FRONTIER BRIGADE, H. M. INDIAN ARMY.

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> "In the present state of our knowledge, then, I do not find it proven, nor do I see any theoretical convenience in taking for granted that Cholera begins as an active blood-change capable of producing primary collapse."—AITKEN, Vol. 1, page 647, Simon, 1868.

AFTER the first epidemic of Cholera Maligna in Europe, A. D. 1829, Broussais declared his conviction that the symptoms of the disease were all referable to an acute inflammation of the mucous tissues of the stomach and small intestines.—See *Tweedie's Library of Medicine,* page 117, Vol. IV. And Dr. George Budd attempts to confute the correctness of this opinion by argument in his article on Cholera in the above work; though he admits *post mortem* appearances in this tissue after death from Cholera, which Louis and Audral both hold to be pathognomonic of inflammation, he also admits increased vascularity and thickening. In Dr. Hodgkin's most valuable work on the morbid anatomy of the mucous membranes, A. D. 1840, page 413, Lecture XX., I find the following foot note:—

"Since this lecture was written, I have had the advan-"tage and pleasure of becoming acquainted with Dr. Boehm, "of Berlin, to whose valuable researches respecting the "glandular appendages of the mucous membranes of the "intestinal canal, I shall, hereafter, have occasion to allude. "From that gentleman's personal communications, as well "as from his valuable memoir, I have learnt that he has "known inflammation of the mucous membrane of the small "intestines produce such a degree of softening of the texture, that the villi have become extensively detached, and "contributed to give turbidity to the increased secretion.

"This phenomenon formed one of the most remarkable "pathological alterations which he observed to take place "in the epidemic Cholera.

"For this discovery he was indebted to the help of the "microscope, an instrument which—improved, as it has "been of late years, through the labors of my friend, "Joseph J. J. Lister, and others—may be considered as "having opened a new field for physiological and pathological investigation."

Annesley in India, before Broussais or Boehm ever saw Cholera Maligna, called the particular attention of the Medical Profession to the connection between the seat of the burning pain during life in this disease, and the vermilion blush on the internal surface of the small intestine which he so often found after death from Cholera, and "in no other disease."

Dr. Jenner and many other pathological observers have recorded the "thickening," *i. e.*, the swelling of this tissue in cases of Cholera. In further support of my own opinion as to the pathology of Cholera Maligna, *viz.*, that it is an acute specific diffuse inflammation of the mucous tissue of the small intestines, I will make one more quotation from Dr. Hodgkin's work, Lecture XXIII., page 513:—

"We know that derangements of the abdominal viscera produce a *remarkably depressing effect.* To a certain degree, this effect is common to all, or most of them but there are peculiarities attending the derangement of certain parts, which induce us to suspect that they are effected, when these peculiarities present themselves. Thus, when the small intestines are the seat of the affection, we find a remarkable state of *collapse;* the extremities disposed to be *cold* and flabby; the countenance depressed, but not presenting the anxiety of heart disease; *the respiration affected,* without evidence of lung disease. This may even exist to the degree of producing *great lividity;* the circulation becomes quick, weak, and sometimes but *little perceptible;* the skin is relaxed; but the perspiration may be either warm or cold according to the degree of collapse.

"Thus we have in cholera the most urgent and rapidly-fatal symptoms, comprehending the extreme of those which I have enumerated with the addition of cramps, vomiting, &c., which appear to be occasioned by the extent of the derangement which, there is reason to believe, from the evidence of inspection, affects the whole of the *small intestines*, and appears as a consequence, to

"Now it is evident, not merely from the inspection of " those cases which have been quickly fatal, but also from " the occasional rapid recovery of those individuals who " have survived the attacks of the disease in its *severest* "*form*, that the lesion of any particular part has neither " been profound nor irreparable. I have seen an illustration of the same principle in the case of a female who " was carried off after a very few hours' intense suffering " from intestinal derangement marked with the symptoms " above related, and in whom the lesion detected after " death consisted in a very extensive diffused redness of " the *mucous* membrane of the *small intestines.*"

The opinions of such men as Broussais, Louis, Audral, and Hodgkin, all four most eminent pathologists, are at least worthy of note. Now hear what Mr. Simon, a pathologist of very high rank also, says in 1860:—

" The characteristic intestinal inflammations of Cholera " and Typhoid Fever, excited, as each of them is, by a " specific ferment which develops itself in the decomposition " of excrement, strongly suggest the existence of specific " textural predispositions, natural or to some extent " acquired, and founded on the textural presence of half-eliminated excremental material."—*Holmes's System of Surgery*, Vol. I., page 88,—Article, Inflammation.

And again, in 1866, he says:—" Every practitioner of " medicine or surgery can recall instances where he has seen " mortal collapse (substantially, so far as I know, not differ-

"ent from the collapse of Cholera) produced by the very "onset of traumatic and other abdominal inflammations, "sometimes of no great apparent magnitude."—*Aitken's Medicine*, Vol. I., page 647, fourth edition.

Sir Thomas Watson remarks on the mode of death being "the same in Cholera as in another acute abdominal inflammation, *viz.*, peritonitis."—Page 64, Vol. I., *Lectures*, fourth edition.

In 1848, Dr. William Robertson, of Edinburgh, analysed the blood of Cholera Patients, and found fibrin in excess, as in all other acute inflammations.

In 1866, Dr. Lionel Beale finds the vessels of each villus of this tissue congested, and in many "ruptured," forming the black spots noticed, I suppose, by others, and considered a sign of inflammation.

Dr. Sutton of the London Hospital, in 1866, found the temperature in the rectum in collapse 102° Ft., when it was at 92° in the axilla, or even below 92°. Here is some evidence of internal *heat*. I have plunged a thermometer deeply upwards and backwards through a trocar in collapse, in the direction of the duodenum, and found it stand at 106° Ft., when it was only 90° in the axilla, and the breath felt cold to the back of my hand as it issued from the dry parched mouth. "Heat," says Mr. Hilton, the talented lecturer on Surgery at Guy's Hospital, "is the true sign indicative of a local inflammatory condition."—See *Lectures on Rest and Pain*, Hilton, 1863, page 63.

Now, if Cholera Maligna really consists of an acute inflammation of the mucous tissue of the small intestine, the remedy "par excellence" above all other remedies that control acute inflammations generally of all mucous tissues, may reasonably be expected to be the remedy for Cholera; and so it is, and so I will prove it to be, so certainly and surely, that, in future, it will amount to criminality on the part of a practitioner of medicine to withhold it.

Dr. Alison of Edinburgh tells, in *Tweedie's Library of Medicine*, Vol. I., page 109, how "several high authorities "on the Continent have expressed a confident opinion of the "antiphlogistic virtue of tartrate of antimony, when given "in large quantity, after *tolerance* of the medicine has been "established, and when it produces *no sensible effect.*"

Sir Thomas Watson says: "The effect of full doses of "tartar emetic in restraining active inflammation of mucous "tissues is well ascertained." And "The system can be "brought to feel its decided influence with much more cer-"tainty, and in a much shorter space of time, than that of "calomel:"—See *Lectures*, Vol. I., page 861, fourth edition.

Simon says: "The antiphlogistic action of certain *emetic "and nauseant drugs* appears, in part, very much to resemble "the action of blood-letting. Under the action of full doses "of antimony, for instance, the pulse, till vomiting occurs, "becomes progressively quicker and feebler, till sometimes "its character, becoming fuller and much less rapid, but "retaining a marked quality of softness. By renewed "small doses of the drug, the relaxed state of the arterial "system can be maintained, and inflamed parts can thus "be continuously kept with all the advantages of lessened "vascular tension"—*Holmes's System of Surgery*, 1860, page 109, Vol. I.

So far so good, I have high authority to support the pathology which I maintain, and equally high authority to support my plan of treatment, granting the pathology to be true. And thinking men will say, if this be simply so, how is it learned doctors have been so long finding it out? I can only say, "*humanum est errare.*"

Hear what one of the most able teachers of medicine modern Athens ever produced, Dr. Alison, says: "But "in the early stage of almost all cases of idiopathic inflammation in the head, as well as in those of the abdomen, "there is so much nausea and vomiting as obviously to "contraindicate the remedy."—*Tweedie's Library of Medicine*, Vol. I., page 110.

I have given over fifty grains of "the remedy" in case of acute inflammation of the mucous tissue of the small inte tines, commonly called Cholera, and my patients are aliv and well.

Case I.—Sepoy Lallman Ram, 44th Regt., N. L., aged 22, was admitted into hospital at Cachar, about 8 A.M on the 17th of February 1869, with severe diarrhœa. Sa he was attacked "last night;" stools large and bilious, and frequent. Temperature of skin normal; pulse soft and slow; tongue moist; breathes short; urine small in quantity and high colour; feels thirsty.

Forty grains of aromatic chalk and opium were immediately given. This checked the diarrhœa, and was followed up with forty minims of laudanum. He slept a short time. That night severe vomiting and purging of a whitish coloured fluid set in, in large quantity; the surface grew cold, burning pain between the ensiform cartilage and umbilicus; extreme thirst; passed no urine since mid-day; cramps in the limbs; pulse imperceptible; features drawn; eyes sunk; fingers and toes shrivelled. Ordered one grain of tartar emetic every fifteen minutes. He vomited after the first and second doses. The remedy was continued without vomiting for two hours and-a-half every fifteen minutes; all symptoms considerably lessened. The antimony was then directed to be given every thirty minutes. In another hour he expressed himself as feeling better, skin getting *warm*, pulse soft and ull, cramps no longer felt. He was discharged well on the 20th. He only had sixteen grains of tartar emetic altogether.

In this case the opium should have been given more frequently during the preliminary diarrhœa.

Case II.—Bhudroo Ram, Sepoy, 44th Regt., N. L. I., d 20 years, was brought into hospital at 5 A.M., on the [illegible] Cherrapoonjee, in a state of intense and purging at 9 the previous evening, and could not rep himself sick, as he was outside the barracks on the gra. When brought in, his skin was entirely cold; breath sho and cold; no pulse; much cramp; retention of urine; terribl thirst; fingers and toes shrivelled; eyes sunk; pupils directed upwards; voice, a hoarse whisper.

Four doses of Tartarized Antimony were given, one grain every fifteen minutes, without the slightest effect; and I feared to persevere, so intense was the collapse. I never saw severer collapse; so I omitted "the remedy," and ordered ammonia and ether and mustard plasters. This was tried for an hour and-a-half without effect; when I reverted to the antimony again, and gave one grain regularly every fifteen minutes. In three hours the breath felt warm, and the skin was not so cold, and the pulse was easily perceptible, he could look at me, and expressed himself easier. In another hour, the skin was warmer, and pulse fuller and soft, and I being xperienced in the use of the remedy, and knowing that ad already taken twenty grains, I ordered four more only at intervals of thirty minutes, and then to omit the ny altogether, and give ammonia and ether. Whil these stimulants, he gradually sunk again int nd died at 6 P.M.

feared to persevere with the antimony, this lived through the attack in my opinion.

Case III.—Sepoy Gokhool Sing, 44th Regt., N. L. I., ed 30, admitted at Cherrapoonjee, on the 3rd of April 869, at 4-30 A.M. He said he had been purged three or our times, and vomited once; passed no urine since his first purge, and had been ill one hour. Whether the stools were fœculent and bilious, could not be determined. At the time of admission, his pulse was rather full and natural; breath warm; skin dry and warm; slight thirst; and cramps now and then in the legs. Forty grains of the aromatic chalk and opium were given at once, but the vomiting increased; purging like rice-water quickly ensued; the pulse grew small and intermittent; breath got short and cold; more cramps; skin got cold; eyes sunk; voice ditto; great thirst and burning pain in the usual place. All these severe symptoms came on within thirty minutes after admission. At 5-30 A.M., the tartar emetic was commenced in one-grain doses, and continued every fifteen minutes until 8 A.M. During this time, he vomited once only, but continued to be purged every now and then; the skin is now getting warm (8 A.M.); pulse fuller; breat easier; cramps lessened; and burning pain less. I directed the drug to be continued in the same doses hirty minutes; and at 11 A.M. he was reported bette respects, but there is still a little watery purging. the antimony was discontinued, and ammonia directed to be given every hour. At 6 P.M fully established, he passed urine at 10 morning. He had slight fever for a fe ischarged well on the 14th.

I stopped the antimony in this case as soon as I felt convinced of reaction, and felt anxious to stop it, not knowing then how safely large amounts of the drug may be given.

Case IV.—Ramkhalawun Sing, recruit, 44th Regt., N. L. I., aged 21 years, was brought to hospital about 1 P.M., 6th April 1869. Stated that he had been vomiting a watery fluid, and had had several loose stools during the past two hours. His pulse was very small, almost imperceptible; breath cold, short, and quick; skin slightly cold and dry. There is suppression of urine; severe cramps and thirst.

1 P.M.—Mustard sinapisms to the epigastrium, and one grain of tartar emetic to be given every fifteen minutes.

3 P.M.—In the next two hours he vomited three times, and was purged a few times; both discharges being a whitish wateryfluid, and very characteristic of the disease.

4 P.M.—In another hour, continuing the remedy, he was decidedly better; all the symptoms lessening.

One grain of Tartarized Antimony every thirty minutes.

6 P.M.—Has not vomited for two hours; still purging now and then in very small quantities; pulse fuller and soft; breath warmer; skin warm; thirst diminished; is looking better in all respects.

At 7 P.M.—The tartar emetic was omitted; he had taken eighteen grains up to this time, and ammonia and ether were given at intervals during the night. He passed a little mucus from the bowels; he passed urine on the morning of the 7th, and complained of nothing but debility.

Ordered Acid Nitrici. m v.

Tinct. Ferri. m x.

In water, three times a day.

Discharged well on the 14th.

Case V.—Doonda Sing, Sepoy, 44th Regt., N. L. I., aged 26 years, was reported at 8 A.M., April 7th, at Cherrapoonjee, to have been ill two hours with Cholera. He was constantly vomiting and purging a whitish colored thin fluid in large quantity; he had suppression of urine; cramps; cold skin; no pulse, or to be felt at intervals very small; breath short and quick, not remarkably cold; great thirst; burning pain between the umbilicus and ensiform cartilage.

Ordered mustard poultices to the abdomen, and one grain of tartar emetic every fifteen minutes. After taking twelve doses, *i. e.* at 11 A.M., he seemed better; vomiting and purging less frequently and in less quantity; skin and breath warmer; pulse fuller.

1 P.M.—Pulse fuller; vomiting and purging stopped; feels better; tartar emetic continued every thirty minutes.

4 P.M.—Skin warm; pulse fuller; breath warm; no cramps; thirst slight; is looking and feeling better. Ammonia and ether to be given every hour. Tartar emétic omitted.

Took arrowroot and port wine during the night; slept for three hours, and passed urine in the morning. Discharged well on the 18th, after taking nitric acid and steel for a week, as prescribed for the preceding case. He took in all twenty-six grains of tartar emetic.

Case VI.—Mahadeu Thappa, Sepoy, aged about 50 years, came to hospital at Shillong, on the morning of the 13th April, with severe diarrhœa.

7 A.M.—Aromatic chalk and opium forty grains. (I always double the quantity of opium in the pharmacopœial preparation.)

9 A.M.—Constant vomiting and purging like rice-water; suppression of urine; cramps; small quick pulse; skin cool; much thirst; breathes deep and slow and gasping, slightly warm. Mustard sinapisms to abdomen.

One grain of tartar emetic every fifteen minutes.

12 P.M.—Skin warmer.

6 P.M.—Has only vomited three times since noon. Still purging in small quantities; no reaction; no pulse; seems very weak. Omit antimony tartar, and give ammonia and ether every hour. Took a little soup and port wine and arrowroot. About 10 P.M. he seemed better; skin slightly warm; pulse small, but perceptible; complains of griping and tenderness in the bowels; and passed a few stools of bloody mucus. My hospital assistant then gave him ipecacuanha and opium, as he was accustomed to give for dy-

sentery, two grains of each every two hours. At 4 A.M. he got suddenly worse, vomiting and purging like rice-water again. One grain and-a-half of tartar emetic was now given every half-hour. Ammonia occasionally, as it seemed to be required. He never rallied again, and died on the night of the 14th.

He was an old man, and a great mistake was made in giving him opium on the night of the 13th. It was a very severe case; and as it appears that he only got thirty or two-and-thirty grains of tartar emetic in all, he could not have had one grain regularly every fifteen minutes, from 9 A.M. to 6 P. M. on the 13th. Some amount of reaction took place about noon, and after that, I am afraid, there was some carelessness in administering the remedy.

Case VII.—Makoond, a barber, belonging to the 44th Regt., N. L. I., aged about 30 years, adimitted at 10 A.M., on the 15th of April, having been constantly vomiting and purging for two hours.

10 A.M.—Pulse very small and intermittent; skin dry, and not cold; breath deep and slow and gasping; suppression of urine; cramps; thrist, &c.; the vomit and stools are like rice-water; burning pain.

Mustard plasters to abdomen; one grain of tartar emetic every fifteen minutes. In two hours the vomiting stopped; purging continued now and then, small in quantity, but of the same character. By 1 P.M., when he had taken twelve grains of tartar emetic, his pulse got fuller; his skin got

Repeat Tartarized Antimony every thirty minutes.

6 P.M.—Is very much better, and says so. Skin warm; pulse full and soft; no vomiting since noon; no purging since 2 P.M. Omit Tartarized Antimony. Ammonia and ether, sago and port wine to be given at intervals.

16*th April*, 6 A.M.—Slept a little during the night, passed urine this morning; no more vomiting or purging.

To take nitric acid and steel.

18*th*.—Discharged well.

Case VIII.—Mohorum, a lascar of the Eurasian Battery of Artillery, admitted about noon on the 12th of May, at Shillong, with symptoms of Cholera.

He stated that he had had ten or twelve stools like "congee-panee" (rice-water), and had been vomiting a bilious fluid. He had no pulse on admission; cold clammy sweats; cramps; great thirst; breath warm, deep, and gasping; tongue dry; eyes sunken; fingers and toes shrivelled; burning pain. To take one grain of tartar emetic every fifteen minutes, and have mustard sinapisms to abdomen. His breath grew cold within an hour after his admission. After a lapse of seven hours, in which time he had taken twenty-eight grains of tartar emetic, all the symptoms were relieved, and the medicine was ordered to be continued every thirty minutes in similar doses. At 8 A.M., on the 13th, he passed a small quantity of high-colored urine and two bilious motions during the morning; having taken forty-four grains of tartar emetic up to this hour. For four hours more it was continued at the rate of one grain per hour, making forty-eight grains in all—when he was anxious for food, and had some arrowroot with a dash of wine in it. In the evening of this day, vomiting and purging returned, and four more doses of the antimony were given—one grain every fifteen minutes; when it stopped, and he fell asleep. From this time he continued to improve without any other medicine, and was discharged well on the 17th. He took fifty-two grains of tartar emetic in less than thirty hours.

In all these cases cold water was allowed as drink, *ad libitum*; sinapisms were applied to the abdomen; and hand-kneading and friction to relieve cramp. If they prove nothing else, they prove that tartar emetic (the most nauseant and depressant drug to be found) does not prevent a cholera patient from "pulling through" his illness and getting well, even though he gets as much as fifty-two grains in less than thirty hours. But they prove more than this; in each case the breath and skin grew warm, and the pulse came back under its use, so regularly within four hours, that, to my mind, no doubt of its influence remains.

The wonderful way in which the medicine is tolerated, fully bears out the high European authorities, as to its power to control inflammatory action after the nauseant effect is gone, as quoted by Dr. Alison in his article on inflammation, in *Tweedie's Library of Medicine.* As to the fact of the inflammation of the tissue concerned, I consider edly, *heat;* the patient feels it, and most loudly complains of it, and it comes to the surface, partly by radiation after death, and partly by the loosening of the hyperœmia in the death. Moreover, Dr. Sutton found the temperature in the rectum 102° Ft., when it was only 92° in the axilla; and I found my thermometer stand at 106° and a fraction over, when plunged deeply down towards the duodenum through the canula of a large trocar, when it was below 92° in the axilla. Now *heat*, says Mr. Hilton, is *the sign* of inflammation. Every officer in India knows well that, if his horse's hock or knee feel hot to his hand, that there is inflammation.

Abdominal inflammations are the *most depressant* maladies known, says Dr. Hodgkin. Sir Thomas Watson says, the mode of death in Cholera is the same as in peritonitis, another acute abdominal inflammation.

The terms heat and inflammation are synonymous, and always have been from the earliest times in all languages. See Mr. Simon's most able article on inflammation in *Holmes's System of Surgery*. Moreover, my cases prove something more; they prove the fallacy of Dr. Alison's statement that tartar emetic is contraindicated in abdominal inflammations on account of the vomiting, and sometimes violent action, on the bowels; at any rate as regards the abdominal *mucous* tissues.

Dr. Jerdon, our able Indian naturalist, told me a few days ago that it used to be a common practice amongst the Sepoys in Madras and other Natives to immerse the lower half of the body in cold water up to the ribs or waist, and keep it immersed until the symptoms of Cholera were over. Now this hydropathic treatment was really good and reasonable, if the acute inflammation theory be true. Whether this practice is followed now or not, he could not tell me, but it used to be a favorite one in Madras amongst the Sepoys.

As for *post mortem* appearances, and the conclusions to be drawn from them, though of great value, the observer must be a very able pathologist, and have had great experience in the morbid anatomy of the mucous tissues, to be able to deal satisfactorily with the most difficult subject in the whole of pathology.

Annesley, indeed, has called the serious attention of the medical profession to the appearances he found in this mucous tissue, "the vermilion blush," which he never saw in any other disease; and Annesley was a pathologist, who could be depended upon; he raised his voice many years ago, now to deaf ears, I take it. The swelling or "thickening" of this tissue has over and over again been described by good observers; increased vascularity, rose blush, black spots, mammillated appearance, denudation of epithelium, exudations of lymph and fibrin.

In calling the subject of the morbid anatomy of the mucous tissues, the "most difficult" in the whole range of pathology, I write with authority, no less a one than Dr. Hodgkin. He says:—

"Whether we examine an inflamed portion of small "intestine in the state which I have just described, in which "secretion is nearly or quite suspended—or, which is much "more frequently the case, when secretion variously modi-"fied has been going forward—we find the mucous mem-"brane itself reddened by the sanguineous injection of its "minute vessels. This indication is so notorious, in the "intestinal canal, as well as in other parts, that it is more "necessary to press the importance of refraining from ad-"mitting it as an evidence of inflammation, than to insist "upon it as one of the proofs of the existence of that "state. It is the fact, that such injections take place "without inflammation, more remarkably in the stomach "and small intestines, than in any other part of the body, "which renders the inflammatory condition of these parts, "perhaps the most difficult subject on which the practical "pathologist can be called upon to form and express an "opinion. The fallacy to which *post mortem* appearances "might lead us, is most evident in the case of the common "integuments: upon which, on the one hand, absolute "paleness after death, where inflammatory redness had "existed during life, &c., &c."—*Dr. Hodgkin's Lectures on the Mucous Membranes,* Lecture XX., page 406. See also *Billard's Distinctions between Passive and Inflammatory Redness,* given in the same work, page 407.

As to the changes in the blood in this terrible Cholera Maligna, they are all brought about by the inflamed tissue action; and, therefore, if you can control this inflamed tissue action with tartar emetic, you will also check the changes going on in the blood. The order in which the constituents of the serum are affected, is thus stated by Schmidt:—The water transudes before the solids of the serum; the inorganic before the organic solids; the chlorides before the phosphates; the salts of soda before the salts of potash; and the order is very much the same as takes place during the action of purgative medicines, such as *elaterium.*

These changes in the blood led Schmidt to the conclusion that the functions of the blood-cells themselves must be greatly impaired; and he found their normal amount of oxygen was lessened by one-half—fifty per cent.! Now, this want of oxygen is not occasioned by want of oxygen in the lungs, for the Cholera patient breathes deeper and quicker than in health; and you may hear the air going into his lungs, if you apply your ear to his chest, plainly enough. It is that the blood, being so altered in constitution by the inflamed tissue action, cannot affect the exchange of its carbon for oxygen in the lungs in its usual quantities which is, I take it, one, perhaps the chief reason of the cold breath, which gets warm under the influence of the tartar emetic, as it checks or controls the inflamed tissue action.

The mechanical disturbance in the circulation of the blood can easily be understood, if you accept the fact of acute inflammation over even a portion of that large tract in question. It was calculated by Sir William Lawrence (the Nestor of Surgery, as the *Times* used to call him), that more than three times the amount of blood flows through the vessels supplying an inflamed tissue, than flows in health in the same time. Now, if three times the amount of blood flows through that large vessel, the superior mesenteric artery, which supplies the tissue in question with blood, (and is but the second large vessel given off from the aorta after it leaves the thorax, the cœliac axis being the first,) that flows in health, the supply of blood to the rest of the body must necessarily be considerably diminished, even if no loss of the fluid portion of the blood took place through the excessive tissue action. This large blood vessel comes off at an acute angle from the aorta just above the renal arteries, which go off at a right angle to the kidneys; how very much their supply of nutritive arterial blood must be interfered with a knowledge of hydrostatics, would enable any one to determine, given the size of the abdominal aorta, the superior mesenteric and renal arteries, their angles of branching off, and rate of flow of contents. This is one reason, perhaps, for the total but temporary cessation of their action; glands must have their normal supply of nutriment, of normal blood, to act normally. And the kidneys receive blood from no other source but these two renal arteries, either for nutriment or excretion.

It is well worthy of note, how, in my eighth recorded case, which really was a very severe one, the secretion of urine came back within twenty hours of his first seizure, he having had the active tissue action of his small intestines kept well under control in all that time with eight and forty grains of tartar emetic; and that, after this, rice-water vomiting and purging began again, and was almost instantly checked by again administering the tartar emetic after it had been omitted some few hours.

The gall bladder is more often described as distended with bile, in those who die in collapse, showing that the action of the liver is not much interfered with, and the gland itself is generally described as normal, or but slightly congested. The reason the bile does not flow into the intestine, as in health, is that the opening of the duct into the duodenum is occluded by the inflamed and swollen mucous tissue. Pneumonia often arises as an after-consequence, after reaction has taken place, *i. e.* after the inflamed action of the tissue primarily affected has ceased. So also inflammation of the kidneys is to be feared; but no other tissue, save the mucous and sub-mucous tissues of the small intestines, has ever been described as primarily inflamed.

Neither of these secondary inflammations, either of the lung or kidney, are so likely to follow reaction, if the primary inflammation is kept well under control with antimony.

My arguments for the disease, being an acute inflammation of this tissue, have been met by old and experienced physicians in India, with the fact of the "very depressing nature of the disease;" but I answer, acute abdominal inflammations are the most depressing affections known, and of these affections, that of the small intestines, are peculiarly so.—See *Dr. Hodgkin's Lectures on the Mucous Membranes,* Lecture XXIII., page 514.

When we take into consideration the magnitude and vital importance of this tissue, we may cease to wonder at the effects produced when it becomes acutely inflamed from any cause.

In point of size, it is the most extensive in the body next to the external skin. Quain gives the length of the small intestines at twenty feet, but it varies, is sometimes more, sometimes less. The average circumference may be fairly computed at four inches; this gives a surface equal to six and two-thirds square feet; then the folds called "*valvulæ, conniventes*" increase this surface by at least another square foot; so we have eight superficial feet all but a third; and if the tube happens to be a foot longer, quite eight square feet of surface, then the inflammatory action nearly always spreads some way through the pylorus into the stomach, and as Annesley found in prolonged cases, into the cœcum and ascending colon. This large tissue tract contains some four million villi; each ¼th of a line in length; each containing its lacteal or human rootlet, and afferent and efferent blood vessels. (See *Quain's Anatomy*, last edition). To give an idea of the size and importance of this tissue, compute the total length of the villi, each being a quarter of a line in length, the whole number equal one million lines, or two thousand yards and over. The Follicles again are very numerous, and Brunner's glands and Peyer's add to the complicity and importance of the tissue.

Is it surprising that upwards of a mile's length of villi, being acutely inflamed, can pour out from the blood the immense quantity of fluid they do in Cholera, and produce such terrible effects on the human frame, even in a few minutes? My reader may say, I beg the question of inflammation, or no inflammation, but remember I have proved the temperature, and I have good authority for various degrees of redness and swelling. The poor patients themselves tell of the pain.

Simon says:—"In the present state of information on the subject, the proposition is by no means established that Cholera collapse ever occurs without bowel disease, enough probably to *account for it.*" The italics are mine, he (Mr. Simon) does not consider "it proven, nor does he see any theoretical convenience in taking for granted, that Cholera begins as an active blood-change capable of producing primary collapse."—See *Aitkin's Science and Practice of Medicine*, Vol. I, page 647, 1868. If this bowel disease with heat and pain and redness and swelling is not inflammation, what is it? and if it is inflammation, it is not chronic, that is very certain, the action is acute enough, whatever it is.

Is there any disease hitherto described as an acute diffuse inflammation of the mucous tissue of the small intestines? Acute inflammation of the mucous tissue of the large gut is well known enough in India, and acknowledged to be acute dysentery. Acute inflammation of the mucous tissue of the stomach, as an idiopathic affection, is described, but is very rare and scarcely credited by most; gastro-enteritis is a term synonymous with typhoid fever.—(Louis)

Enteritis is a well-defined acute inflammation of a portion of the muscular coat of the intestine spreading to the peritoneum outwardly, and sometimes to a circumscribed portion of the mucous tissue, corresponding in extent to the amount of the muscular coat involved as a sequel. Peritonitis is of the peritoneum, and has nothing to do with mucous tissue.

There are local circumscribed acute inflammations of the mucous tissue of stomach and small intestine ending in ulceration, difficult of diagnosis, killing by perforating their walls, and inducing peritonitis.

Sub-acute and chronic inflammations of Brunner's and Peyer's glands are well known and described, but nowhere, by none, a specific acute diffuse inflammation, such as, I maintain, is cholera maligna.

Again, how is it possible to account for the action of the most depressing drug antimony, as shown in my eight recorded cases, on the most depressant malady, unless we admit that it really is an acute inflammation which produces the symptoms.

I have the "brilliant genius"* of Broussais, the high authority of Louis, Audral,† Dr. Boehm, Mr. Simon, and Dr. Hodgkin, to support me in pathology, and I declare my conviction that, in the future, any practitioner of medicine will render himself liable to a criminal prosecution, who loses his patients from Cholera, without having given antimony in the way I propose and practice, taking into due consideration the severity of the case, the patient's age and constitution, &c., &c.

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* Hodgkin.

† Louis and Audral declare the "mammillated appearance" so often found in the mucous tissue of the small intestines after death from Cholera (see Budd. G.) to be always a result of inflammation.

The Cause.

All past experience and investigations point to a living organism; one of the minutest and lowest forms of animal or vegetable life, *indigenous* to Bengal, or at most to India and dependant for existence, means of life and increase, on its own proper food or nidus, decomposing human excrement.

Prevention.

Deprive the foul atom of its means of life and increase, by taking every precaution against the pollution of air or water with its food. Sewer the towns and cities thoroughly and well, and return the offending matter to the land; keep the camp and the fair clean by burial. Remember that the chemists* have decided that "there is no chemical disinfectant that is even in a remote degree so efficacious as earth, and that even the earth has its limits;" there must be no cess-pits; it must be distributed "to till the earth."

And remember the old law of Moses, Deuteronomy, Chap. xxiii., verses 12 & 13. So we may get rid of Cholera, and at the same time typhus and "the fever like it"—(Hodgkin). Typhoid, which Louis makes synonymous with gastro-enteritis, an inflammation of the same mucous tissue, only more particularly affecting certain other glands in it and not the villi.

APPENDIX.

Case IX.—Sepoy Soona Ram, 44th Regiment, N. L. I., was admitted into hospital, at 9 A.M., on the 25th May 1869. Says he had several bilious stools during the morning, and vomited undigested food.

Pulv. Cretœ co. c. Opio., grs. xl (with one grain of opium added) was given at once, and directed to be repeated in two hours. Just about 11 A.M., however, he began constantly vomiting and purging the rice-water excretion; got cramps in the legs and hands; great thirst; no urine; pulse very small, feeble, quick; skin cold; fingers and toes shrivelled; respiration deep and labored; tongue dry. To take one grain of tartar emetic every fifteen minutes. After taking twelve doses, the purging lessened; the cramps also; he continues vomiting, but not so often, and throws up little or nothing; feels sick.

One grain of the drug to be continued every thirty minutes. At 5 P.M. surface warmer; no purging; pulse still small and quick; and feels sick. One grain tartar emetic to be continued every fifteen minutes again.

At 8 P.M. he was decidedly better; pulse fuller and soft; and he complains only of hiccough and nausea.

From this hour the tartar emetic was entirely omitted, and he only got twenty-five grains altogether; though, if time had been kept, he would have had twenty-nine or thirty grains.

He took soda and ammonia and ether occasionally during the night, and slept a little. At 9 A.M., on the 26th, he threw up three common lumbricals, after which the nausea lessened.

He had hiccough during the day, but no other annoying symptom, and no Cholera symptoms. He took a little sago and brandy during the day. Early the next morning he passed urine for the first time for forty-two or forty-three hours.

28*th*.—Hiccough gone; doing well in every way in hospital.

He had mustard sinapisms and cold water as usual. Another fact to prove, or help to prove, that the affection is produced by the direct action of the cause on the tissue, and not on the blood, is that it is the secreting apparatus of this tissue that is inflamed, the villi, not the excreting glands, as are Peyer's in gastro-enteritis or typhoid fever.

Dr. Boehm says he found the texture softened, and the villi actually detached. Annesley's "vermilion blush," which he found in no other disease, was, doubtless, caused by the injection of the villi. Dr. Lionel Beale found their vessels gorged with blood, and sometimes ruptured; the ruptured vessels give the appearance described by other pathological observers as "black spots."

If there was a "primary blood poison," those glands, which are engaged in excreting effete matters from the blood, would be affected, not those which are engaged in feeding the blood with new nourishment from the chyle. The degrees of inflammation of this tissue containing, according to Quain, four million villi, or thereabouts, vary as inflammation generally does, as Paget says, from a degree so slight that there is scarcely any appreciable symptom to mark the variation from the point of perfectly normal action, to a degree so acute and rapid, that the tissue may be destroyed in a few hours; and in the case of a tissue of such vital importance as the one inflamed in Cholera, and which is "peculiarly liable to induce great depression and collapse," it sometimes kills in a few minutes through the effect on the nervous system.

And as the degrees of inflammation vary, so vary the symptoms, from one slightly loose motion, which may or may not arrest the attention of the patient himself or herself, through all the various degrees of diarrhœa often controlable by opium (though not always, as seen in some of my cases) up to that violently acute action, which is pathognomonic of Cholera Maligna. We all know how general bowel complaints of apparently ordinary and various degrees of diarrhœa are during Cholera epidemics. And Cholera is a specific and peculiar disease, caused by one cause alone, that atomic organism, *indigenous* to India which feeds on decomposing human excrement, left all over India on the surface of the ground to pollute the air, or washed into the rivers to pollute them. It is but of little use to build the best of hospitals or barracks, and leave two hundred millions of people daily to keep up the supply of the malignant pestiferous atoms, by leaving their natural food or nidus, everywhere, to pollute the air and water, directly disobeying one of Nature's laws—laws framed by the same great Being who gave man brains to learn and comprehend them.

Case X.—Sham Lall, Sepoy, 44th Regt., N. L. I., aged 22 admitted into hospital at 9 A.M., on the 2nd of June 1869, with frequent and severe bilious purging and occasional vomiting of a bilious fluid. Says, he has been ill with indigestion and looseness for ten days, but got much worse last night: first got ill on joining head quarters of Regt. from Jowai, out-station forty miles off. Immediately on admission he was ordered forty grains of the compound chalk powder with opium, with one grain of opium added, and to take twenty grains, with one grain of opium added every two hours.

This was continued until 10 P.M., in which time he got nine grains and-a-half of opium, with no good effect; and at this hour, the vomiting increased greatly, and the purging and the matter voided resembled rice-water; pulse very small and quick; skin grew cold; much thirst complained of; retention of urine; cramps in the arms and legs; respiration laboured; breath cool. Ordered one grain of tartar emetic every fifteen minutes, and mustard sinapisms every now and then to epigastrium.

3rd June, 6 A.M.—Since he began taking the tartar emetic, he has only had one stool; but he has vomited frequently; skin warmer; pulse fuller. To continue the one grain of tartar emetic every thirty minutes.

1 P.M.—Not much better; no purging but constant vomiting.

5 P.M.—Worse; skin colder; no pulse. To take the one grain every fifteen minutes.

8 P.M.—Surface warmer; respiration also; pulse small and quick; has vomited three times only since 5; no purging; no cramps; feels sleepy. To continue the one grain every quarter of an hour until 9 o'clock, and then, if progressing favorably, every thirty minutes.

4th June, 4 A.M.—Passed urine; is quiet; no vomiting; no purging; doing well; complains of hiccough. Ordered bicarbonate of soda; omit the tartar emetic. In the course of the day, the hiccough stopped, and he took sago and wine.

My hospital assistant calculated that he took altogether seventy-eight grains of tartar emetic; and during the first twelve hours, nine grains and-a-half of opium for the diarrhœa.

He passed no urine for about six-and-thirty hours.

6th June, 5 A.M. Doing well in hospital, and rapidly regaining health and strength. Case No. IX. is also doing well, and will be discharged in another day or two.

The degree of collapse is the measure of the degree of inflammation, the more intense is the collapse, the more violent is the inflammatory action which causes it, and the controlling agent must be used in proportional quantity and with proportional frequency. I have known the warmth depart from the surface, and the pulse disappear from the wrist, in other cases, after from twenty to thirty grains had been given regularly one by one, and warmth and pulse had re-appeared; because the remedy that controlled the inflammation had been left off too soon, or given less frequently, and recourse had to be made again to one-grain doses every fifteen minutes for two, three, or four hours, before reaction could be brought about a second time.

This case beautifully demonstrates what I am so eager to prove, and convince others of with hundreds of cases that I will publish within a year, that collapse in Cholera indicates the most acute and violent inflammation going on, unseen, in that most vital tissue, the mucous tissue of the small intestines, going on rapidly to destruction; that for reaction" is waiting upon death; it must and can be controlled, as I control it, as I have been taught by the highest authorities in medicine acute inflammation in other mucous tissues is to be controlled and kept within bounds; not all inflammations, but all of the acute sthenic class, specific or not.

Whilst he was only taking one grain every thirty minutes, I was losing ground, and the enemy gaining. The patient grew worse; grew colder on the surface and hotter inside (heat, mind, signifies inflammation), so I ordered the one grain every fifteen minutes again; and in three hours the point at issue between me and the hidden fire within was settled; the surface grew warm, and the pulse showed that the internal determination of blood was overcome.

I knew I was wielding the most powerful weapon I could have recourse to. I could not bleed, unless I could get at the superior mesenteric artery; there was no blood elsewhere to be drawn, save, perhaps from the carotids. I knew that I had lost Case No. II., through fear and doubt of pressing the most depressing remedy against the "most depressing disease" too far; and I knew that the cause of the depression without, was the violent action within, so I doubled the rapidity of my depressing fire, and put out the enemies at last; he should have had it quicker still if he had not quickly given in.

The severity and obstinacy of this case is proved by the total inefficacy of the opium to stop the preliminary diarrhœa, and this same thing happened with some of the preceding cases; but not in so marked a manner, nor after such a fair and thorough trial. He took nine grains and-a-half of opium in the compound chalk powder, in the twelve hours immediately preceding the setting in of true Cholera symptoms. Still opium should always be given whilst the symptoms are those of diarrhœa only, freely and fairly. I have had several cases of diarrhœa during the past few weeks, which might have ended in Cholera, one and all, if it had not been for the use of opium.

This man had disturbance in the bowels, indigestion, and more or less diarrhœa for ten days before the Cholera symptoms set in, caused, I presume by the Cholera poison, but the Cholera poison of itself causes no depression or collapse, it may, no doubt it is, most frequently digested or destroyed and excreted without a symptom, frequently with a little diarrhœa, caused by a minor degree of inflammation, (usually denominated "irritation") of the same tissue, by the direct action of the poison or ferment on the secerning and secreting villi, easily allayed and soothed as most minor degrees of inflammation of all kinds in all tissues are, more or less, with opium. It is only in certain constitutions, or certain states of constitution or idiosyncracy, (in London it was remarked in the last Epidemic that the anœmic were most liable to Cholera. I was taught when I was a young student that the *anæmic are* most liable to local congestions and inflammations) that the poison at once or finally leads to or excites that violent tissue action which constitutes acute inflammation: and collapse is the special peculiarity of affections of the small intestines, specially of the mucous tissue of their upper portion, of the duodenum for instance, and commencement of jejunum.

I am sure it is the acute inflammation in Cholera which causes the depression and collapse, profound in degree, in direct proportion to the degree of inflammation; and that it is not the direct action of a blood poison.

I have begun to give my convalescents from Cholera, potash and salts to replace their loss in the blood, and afterwards iron; and these measures hasten the complete restoration to health, I think. At present I give the bicarbonates of soda and potash; but whether or not they or the chlorides and phosphates are best, I am not sure, and should like to ask Dr. Bence Jones.

The alliance between Cholera and Typhoid or "dirt fever" or "gastro-enterique" is certainly very close; Cholera is produced by the direct irritation of an invisible atom, in myriads, on the villi, which "invisible scavenger" (Owen) feeds on the decomposing atoms of human ordure in the air and waters of Bengal and Southern India, and the valley of the Ganges as high as Hurdwar; spreading often, chiefly through human intercourse, causing epidemics of Cholera, multiplying in inconceivable numbers in those localities where it finds its food; its food the *sole* cause of Typhoid Fever which less inimicable to human life becomes absorbed, and is excreted in the course of a three-week's fever by Peyer's glands.

Is not Typhoid Fever always more or less endemic in those localities in Europe where Cholera epidemics show most readily and certainly? In the low-lying, ill-drained part of the town; in the street that is supplied with polluted drinking water; or the house with the "privy smell" in it? To give an idea of the size of these invisible molecules, Dr. M. C. White calculated, upon Ehrenberg's estimate, that the Monas Corpusculum is not more than the $\frac{1}{24000}$th part of an inch in diameter; that its ova, and the spores of minute fungi are only the $\frac{1}{10}$th part in linear dimensions of their parent organisms; concludes that there must be an incalculable amount of germs no larger than the $\frac{1}{240000}$th part of an inch in diameter. Now M. Sullivant and Wormley say that vision with the most powerful microscope is limited to objects of about the $\frac{1}{80000}$th part of an inch in diameter, we need not be surprised if Infusoria and other organisms appear in putrescible liquids in far greater numbers than the germs in atmospheric dust visible by the aid of microscopes would lead us to expect. See *Somerville's Molecular and Microscopic Science*, Vol. II, page 67.

To tell of their use in the economy of nature, I will quote Owen: "They are useful for devouring and assimilating the particles of decaying animal and vegetable matter from their incredible numbers, universal distribution, and insatiable voracity—they are the invisible scavengers for the salubrity of the atmosphere. They perform a still more important office in preventing the gradual diminution of the present amount of organic matter upon the earth. For when this matter is dissolved or suspended in water in that state of comminution and decay, which immediately precedes its final decomposition into the elementary gases, and its consequent return from the organic to the inorganic world, these wakeful members of Nature's invisible police are everywhere ready to arrest the fugitive organic particles, and turn them back into an ascending stream of animal life. Having converted the dead and decomposing matter into their own living tissues, they themselves become the food of larger Infusoria, as the Rotifera, and numerous other small animals which, in their turn, are devoured by larger animals, as fishes, and thus a pabulum fit for the nourishment of the highest organized being is brought back by a short route from the extremity of the realms of organized matter."

But either some of these species of invisible infusoria or fungi or ferments are unfortunately for man, like some of the visible ones, poisonous to him and excite inflammation in the tissue engaged in secreting his daily supply of nourishment, by direct and irritating contact with the delicate lacteal, or human rootlet; having escaped the action of the gastric digesting fluid, through some temporary or old standing stomach derangement, as in the drunkard or dram-drinker, or ancemic. Or they are rendered poisonous, by undue numbers brought into existence, by undue calls upon their use in the creation, owing to man's neglect of standing sanitary orders, "cover all that cometh from thee.". Or again they, the "invisible police," not being in sufficient numbers to perform all the scavenger's work of crowded town, or ship, or camp, and man's sanitary measures being very defective, the decomposing animal remains, in invisible atoms, in air or water, or on food, get absorbed into his system and plague him with Typhoid Fever, or the Plague itself, or Typhus or other pestilence.

Some invisible infusoria of certain species are poisonous to cattle; some invisible, some visible are poisonous to the higher plants which by cultivation yield food to man—corn, grape, potato, &c.

"One of the most unaccountable circumstances in the history of the lower fungi is their sudden appearance in immense numbers, and the rapid extension of disastrous and destructive epidemics caused by them among plants and animals, as the potato murrain and the vine disease, which, though widely spread through Europe and Madeira, leaves the North American vines unscathed, whether grown at home or abroad.

"The black mildews at one time raged so much in the Azores and Ceylon as to threaten the complete annihilation of the orange and coffee plantations. Their ravages have been scarcely less among the olive trees in some parts of Europe; and the Lanosa Nivalis, which grows in the melting snow in spring, is supposed to be the cause in many instances of the death of the germs of the sprouting rye. The destructive course of most of these has abated, but the silk-worm disease still continues. The fungi require warmth and a moderate degree of moisture for their development, but the unwonted multitudes in which the parasites occasionally appear, possibly indicate some meteoric influences of which we are ignorant."—*Somerville's Molecular and Microscopic Science*, Vol. I, page 297.

No doubt "meteoric influences" have not only a decided influence on the Cholera ferment itself, but on the condition of its food as to its fitness as a nidus, and also on the high organism, man himself, as regards his condition, to resist the action of and repel the poison harmlessly.

The temperature of the atmosphere has a marked effect in endemic situations. Dr. Chevers tells me that Cholera is always on the increase in Calcutta from January to the setting in of the rains, annually, *i. e.*, as the temperature rises. Electrical dicharges must have their influence by polarising the oxygen of this atmosphere and hastening decompositions. Winds carry the spores from place to place, storms of rain may wash them away.

And when the spores arrive at a place, in air or water, or on clothes or merchandize, with troops or pilgrims in caravan, or ship, or wind, they must, be it remembered, have a fitting "nidus" to develope themselves into the perfect individual, and multiply.

They will *wait* for a nidus.

They are extremely tenacious of life. The germs of some Vibrios resist the destructive effect of a temperature of 212° Ft.

The spores of some fungi, grow after being exposed to a temperature of 248° Ft., and are only killed by a temperature of 266 ° Ft.

As, says Mrs. Somerville, "neither spores of the fungi nor the germs of the infusoria are ever exposed to so high a temperature while in the atmosphere, they are ready to germinate as soon as they meet with

Doubtless, each species, probably each variety, has its own peculiar and necessary food; and I suppose, that invisible minute organism which causes that acute inflammation of some or all of the four million villi of the small intestines, known as Cholera Asiatica, must have decomposing human excrement in a warm moist climate to thrive and multiply in incredible numbers. Let those who are engaged in the question, look for them in the right place; I am sure they will find them when they get microscopes of sufficient power.

The intestinal canal of man and the higher animals is *always* peopled with vibrios and their germs, these are not the cause of Cholera.

"It is not the worm that destroys our dead bodies, it is the infusoria the least of living beings."—See *Somerville's Molecular and Microscopic Science*, Vol. II, p. 67.

That none of these infinitesimal atoms are ever produced, save from the ovum, or from the division of parent forms, I may as well quote Schultzs, proof of non-spontaneous generation as given by Mrs. Somerville in the above quoted work: "Schultz kept boiled infusions of animal and vegetable matter for weeks in air which had passed through a red hot tube, and no animalcules were formed, but they appeared in few hours when the same infusions were freely exposed to the atmosphere, which shows clearly that the germs of the lowest grade of animal life float in the air, waiting as spores do, till they find a nidus fit for their development."

From Orton in England, in 1829, to Dr. John Murray in India, 1869, thousands of observers have noted that the cause of Typhoid ("gastro-enterique") viz., air or water polluted with decomposing human excrement is closely and intimately connected with outbreaks of Cholera in an epidemic form, and that Cholera will no more live in a clean town or camp than Typhoid Fever will. Yet Typhoid is *always* present in dirty towns all over the world, Cholera only occasionally as an epidemic except in certain large cities in, and on the east and west of, the shores of the Gangetic Delta, and in these cities Typhoid Fever and Cholera are *both* always present. The natural inference is that there is something more required to produce Cholera, or it would be always present, in all towns all over the world where Typhoid or gastro-enterique is always present. What day in the year is the London Fever Hospital without cases of Typhoid? The something more must be peculiar to Bengal or the Delta of the Ganges, the "Home of Cholera," and its existence dependant on the supply of its food or means of increase. Doubtless it is a species of Owen's "invisible scavenger" indigenous to Bengal, a *poisonous* species; there are large *visible* poisonous species of fungi, why not poisonous ones among the minute *invisible?*

Why should not the winds, people, clothing, merchandize, &c., carry the germs so tenacious of life from place to place, so that they should occasionally find their fitting nidus, and finding it, germinate and grow and increase and multiply? in degree dependant on amount of "fitting nidus" found, and favouring atmospheric influences, as stillness, amount of electrical disturbance, polarized oxygen, and temperature?

What is the blue haze described by Glaisher—A cloud of the germs of the "invisible scavengers" or excess of unpolarized oxygen?

When there is a diminution of ozone or polarized oxygen, in the atmosphere, decompositions of organic matter into its ultimate elements is retarded, and the "invisible scavengers" revel in plenty of food, and increase and multiply in inconceivable numbers. Specially perhaps that poisonous species, indigenous to Bengal, which causes Cholera. Hence theories of electrical and atmospheric sources of a direct nature acting on the blood or nervous systems, directly. A want of electrical discharges begets a want of ozone, which want retards the decompositions of dead animal and vegetable matter into its ultimate elements by oxygenation, and increases the supply of food for the invisible scavengers to an undue amount, causing them to increase faster than the higher infusoria who feed upon them.

In Bengal as long as the custom prevails of leaving every pound of human ordure to be exposed to the atmosphere, unburied, or washed into the rivers by rain, it is of course reasonable to suppose that a *constant excess* of the invisible scavengers and amongst them the one causing Cholera, exists, in the "Cholera Home," causing a direct punishment to fall upon the people, for neglect of the old Divine standing order "cover all that cometh from thee." And worse still the germs travel from place to place, and all the world suffers for the sins of Bengal.

It is imperative on the Government, if not for the sake of their own people and their own pocket, yet in bounden duty to their neighbours, to "stamp out" this terrible disease, by enacting measures for the thorough carrying out of the old law "cover all that cometh from thee" in Bengal especially, and throughout India generally.

Taking the population at two hundred million, and the square miles as given by Thornton at 1,400,443, there is lots of land to do it. India is not over-populated, and is not likely to be as long as over eighty per cent. die of Cholera. In six days in June 1869, at Saugor, in Central India, 811 deaths occurred out of 935 attacked, see the *Englishman* of the 3rd of July; and at Jubbulpore, shortly after, only 70 were saved out of 280 or thereabout, see the same journal of a few days' later date.

As regards preventive measures, the dependance in the whole of creation of life of one species, or one variety, on the life of another, was never more prettily shown than by Darwin's story of the bee and the clover. The clover could not flourish without the bee, and the bee could not live without the clover. At any rate they are proved to be more or less dependant on each other. I believe to the extent of life in the case of the clover, or both. So the Cholera invisible fungus cannot live and increase and multiply by myriads, without its food, human excrement.

Mutual dependancies of many kinds are to be found throughout Nature; and it is, undoubtedly, necessary that all species, both animal and vegetable, must have food, or become extinct.

It is necessary for the fulfilment of the great natural laws, as established by the Creator of all things, that man should return to the earth all that he takes from the earth; he is ordered to "till the ground;"

The people of India are in direct opposition to these laws; everywhere throughout the land, the Hindoo and the Mussalman leave that which they are ordered to cover, on the surface of the ground, to pollute the air and the waters with decomposing atoms of that which was intended to nourish the land and afford food to the vegetable in the ordinary round of nature. Instead of enriching the soil, it affords a nidus for the germs of that poisonous variety of invisible fungi, or "invisible scavenger" of Owen, a variety indigenous to India, which, multiplying in incredible numbers, is carried about from place to place by winds and waters, deposited on food and clothing and merchandize, invisible, unseen, unsuspected germs waiting their fitting nidus for development and increase.

Their fitting nidus causes Typhoid Fever or "gastro-enterique" in the dirty city, town, or village all over the world; but India is doubly cursed for her disobedience by an invisible atom still more poisonous to man than the poison it battens on. I believe the dreadful consequences to man, of his neglect of the Divine standing orders, was thoroughly well known and threatened by the all-wise Creator and framer of the natural laws which govern the universe; which laws, if carried out by the help of man whom He created, would render the abode of man free from pestilence, and also free from famine, for by carrying out these orders fully, the land would be fairly and honestly "tilled." The word "till" in the Hebrew tongue embraces the whole of agricultural processes. Very true is the old proverb that "cleanliness is next to godliness." The means of *carriage* of filth from the crowded city, town, or village, that it may be returned to the earth to nourish it, is a matter of great difficulty; generally it is found that under-ground water-carriage by means of well-constructed sewers is the most feasible method; the objection is that the great quantity of water necessary, impoverishes the material so immensely as to render it almost valueless as manure, but this might be overcome.

I can imagine an entirely new city built upon a system of underground Railways, like the parcel Railway of the London Post-Office, by which means every house could empty its refuse daily in dry its way, halting at an opening, communicating with an outer basement story to each house. And at the same time, the train would leave a box of dry clean earth at each house.

The "invisible scavenger" would not find much food to batten on in a city like that. Typhus and Typhoid Fever could not exist; and if the winds or human travellers brought the germs of the Cholera ferment there, they could not increase and multiply; not finding a "fitting nidus," they must perish or "pass on" to the dirty city for lack of food.

It is the house with the "privy smell" in it, or polluted water-supply, where Cholera finds a home. To account for Cholera breaking out in a British regiment in well-built clean barracks, where every sanitary precaution is scrupulously attended to in India, it is only necessary to suppose that not only germs but fully developed fungi or ferments are carried into them by the wind from an affected Native town, village, or district, far or near, in inconceivable myriads, unseen, unfelt, inconceivably minute; some amount of food or nidus emanating from dirty bodies or dirty clothing they are sure to find amongst a large body of men, notwithstanding every precaution. But the cleaner those barracks are, the cleaner the person and bed and body-clothes of the men, the sooner they (the fungi or ferment) will perish. Then, alas, in India, especially in "its home," in the cities of Bengal, there is always "the fitting nidus" in great plenty, and favoring atmospheric and electrical conditions constantly occurring. No people in the world are so filthy in their habits as the people of India, and no people in the world are so cursed with pestilence and death for breaking the laws of the Almighty. The Imperial Legislature must enact Police Laws and Regulations to overcome the evil—a mighty task that will not be perfected in less time than a generation. The prejudices and ignorances of the people are too great.

The periphery or the centre of a nerve of the Sympathetic System being irritated by an animal, vegetable, or mineral poison, by electricity or any other form of force, inflammatory tissue action is induced in the tissue supplied by that nerve; the centres of the Spinal System are more or less affected, and cramps or tetanic spasms are observed.

When abdominal tissues are affected, as in Cholera, the disturbance in both the Sympathetic and Spinal Systems is so great, that many observers have been led to place the disease, or the proximate cause, in a primary derangement of one or other of these nerve systems, being led away from the true seat of the disease and its nature, by the participating nervous excitation in one system and depression in the other.

And except when a nerve centre or nerve in its course is affected, the primary influence is on the periphery of the Sympathetic, in all inflammatory diseases on the minute filament in the villus; first in Cholera, guarding the lacteal and rendering it sensitive to the presence of poisonous ferment or invisible undigested living harmful atoms. Then, suddenly, during the process of absorption of chyle, the guardian Ganglionic System receives the warning note of irritation from its ultimate fibrillœ in the villi, the process of absorption is arrested, a directly opposite and repellent process is brought about through the nervous influence, a vastly increased and perverted tissue action, with a vast determination of blood, a "vermilion blush," an erythema, and finally a diffuse acute inflammation, if uncontrolled, destroying the tissue. Causing death in any stage, first or last, according to the susceptibility of the patient; or passing through all stages safely without destruction of tissue.

Simon says: "The characteristic intestinal inflammations of Cholera and Typhoid Fever, excited as each of them is by a specific ferment which develops itself in the *decomposition* of *excrement*, strongly suggest the existence of specific textural predispositions, natural or to some extent acquired, and founded on the textural presence of half eliminated excremental material."

The difference is, I believe, this: in Typhoid the blood is poisoned, there really does exist a primary blood poison, and the poison is excreted by Peyer's glands and the skin, in the course of a twenty-one day fever; and the poison is, invisible atoms of decomposing human excre-

In Cholera, the villi are directly irritated by a poisonary fungus or ferment which has escaped the action of the gastric fluid, *indigenous* to Bengal, a variety of the “ invisible scavenger,’ which feeds on invisible atoms of decomposing human excrement in air and water.

Its germ possessing a power of maintainnig its vitality for some few days only, waits for its own proper nidus, and being carried by means of human intercourse from its home in Bengal, germinates and multiplies in the town or city, causing an epidemic where Typhoid, caused directly by the presence of its food, is endemic.

If this theory be wrong, to act on the supposition that it is right can do no wrong, for the preventive measure that is immediately suggested is to render this poisonous variety of the “invisible scavenger’ extinct for want of food by obeying the old law, “cover that which cometh from thee.”

Pettenkoffer’s supposed emanations from soil will not rise if the soil be not over-taxed, the soil even “has its limits,” though no chemical disinfectant has, even in a remote degree, its disinfectant power.

The soil must not be crowded with decomposing matter, it must be *distributed* to the soil and covered by the soil for safety, at least nine inches deep. Of the means of carriage from village, town, and city I have already spoken; they vary according to circumstances, but should be so managed that neither air nor water be polluted, save only the underground current of water in the well-trapped sewer required for carriage, if sewers are used.

The “specific textural predisposition, natural or acquired,” would account easily, for the few only suffering from a cause all are alike exposed to, for the many who suffer slight inflammations or irritations giving rise to Diarrhœa only, compared with the few who suffer the greater inflammation giving rise to the peculiar symptoms of Cholera.

Why should a man live for years in an atmosphere polluted with the cause of Typhoid, and escape with impunity for a time, and finally fall a victim? Why should the visitor or the new-comer die of Cholera in Calcutta, and a resident live there for a quarter of a century before he gets the disease, and then get it and die? This all points to natural constitutional powers of life, idiosyncrasies, "specific textural predispositions," natural or *acquired*; digestive functions and strength and soundness of mind and body. Whether the depressant action on the Sympathetic is primary, and so intense as to paralyse it, and whether the poison acts primarily on the centres or on the peripheral branches in the villi, is of no practical importance, if the result, acute inflammation of the villi, is the same; or whether the acute tissue action paralyses the Sympathetic, and thus causes the "remarkable state of collapse," is of secondary import, if we know there is acute inflammation and that holding it in control by antiphlogistic measures, are the special means by which we can relieve the symptoms.

It is that "remarkable state of collapse" which hides the ordinary symptoms of inflammation, and misleads, tempting us to resort to stimulants, vinous, alcoholic or diffusible, and thus adding fuel to fire.

Dr. Samuel, of Königsberg, produced inflammation of the Cornea and Conjunctiva by irritating the Casserian ganglion, showing the immediate influence of nerve on tissue apparently.—See *Simon*, page 62, Vol. I.—*Holme's System of Surgery*, 1860.

In the same page of the same volume is a reference made to Dender's and Dr. Snellen's and Traube's Experiments, proving that injuries to sensitive nerves only cause inflammation in the tissues they have ceased to supply, by rendering them less sensitive and more liable to suffer from irritative atoms directly falling on the tissue. So the sensitive nerves of the stomach and small intestines being deranged in action, may allow irritative atoms to be so far absorbed into the villi, as to produce an excessive repellent tissue action running quickly into inflammation. Whereas had the nervous supply to the tissue been of usual quantity and quality, they, the irritating atoms, would have been kept out altogether, beyond the epithelium, and passed on without a symptom.

With regard again to sanitary and preventive measures, if you except what the winds and visitors bring from other quarters, and grant a plentiful supply of good water, I am sure, an ordinary standing camp with 210 paces front by 360 deep, for 800 men, on fair ordinary soil, with a gentle slope to allow of easy drainage after rain, could be kept perfectly healthy for months anywhere and perfectly sweet and clean, and that without having anything taken out of its own bounds.

In such a camp, there are two hundred and thirty superficial feet to each man (I exclude all animals, dogs, horses, &c.) Now say such sanitary arrangements are made, that one cubic foot of soil is allowed to each man daily, to bury or to have buried, all that comes from him daily one foot deep.

There would be no emanations, the soil would absorb all the decomposing animal matter produced in that camp, day after day, for as many days as there are superficial feet to each man, or 230 days. At the end of this time the camp would be perfectly clean and healthy so far as its ground is concerned within its own boundary. Epidemics and Zymotics may be brought to it from affected neighbourhoods far or near, by winds or by human intercourse, or importation of clothing, &c.

The fallacy of Pettenkoffer's theory of emanations from decomposing animal or organic matter in the soil, will, no doubt, be soon established. It is in direct opposition to the decision arrived at by the English chemists last October, as to the immense disinfectant power of the soil. It is in direct opposition to the natural course of events, the soil must have decomposing animal or vegetable matter to enable it to retain its productiveness, and it greedily absorbs all such matter. In India two hundred million of people leave decomposing animal matter *on* the soil not *in* it daily.

If man overloads the soil with decomposing animal matter in cesspits and deep wide trenches, there will arise emanations from the soil; little animal matter gets beneath the surface except what man puts there himself.

If the soil is overloaded with decomposing vegetable matter, who is to blame? Man alone, who neglects to "till the ground."

But vegetable decompositions do not produce Cholera pestilenta, or Tyhoid Fever; these are not diseases of the uncultivated forest, prairie jheel, morass, bog, or fen or jungle, go there, and you get Dysentery, Intermittent and Remittent Fevers and Ague Cake or enlarged Spleen.

Man produces Cholera and Typhoid Fever himself by congregating together in numbers, and failing to return to the earth that he took from it, in a fit and proper manner tilling the ground. He has badly constructed sewers, or none, to convey the decomposing matter away to the land from his cities and town, or he has cesspits, or runs it all into his rivers, or in India he leaves everything of the kind with the utmost indifference on the surface, for visible and invisible brute scavengers to batten on—some of the invisible are thereby enabled to multiply in such incredible myriads that pestilence and death ensue as a natural consequence to him for neglect of laws ordained by the Creator. The ebb and flow of the subsoil water will matter not, if the soil is properly "tilled."

If Pettenkoffer knew how two hundred million of people in British India are allowed to live in utter disregard of these preventive measures, and if he ever takes a walk round an Indian village shortly after sunrise, or delves into the sanitary arrangements of a thickly populated native town, he would know, and would not wonder that the Cholera producing "invisible scavengers," found a genial home in Bengal, or that Typhoid Fever was common.

Even the "City of Palaces" is no exception. Simla is rather worse if anything. Bury your dead or burn them, "cover that which cometh from thee," do not tax the utmost limits of the soil by crowding dead animal matter in it, distribute it, and clear and drain and cultivate.

Cases XI and XII.—Two severe cases, both getting some reaction in seven hours, and both relapsing again in three more, because the controlling agent was given less frequently too soon; one ending fatally, showing well how carefully you must watch for a fall of temperature at the surface when you are leaving off the antimony, and how much depends upon the regular administration at short intervals.

To illustrate how quickly mineral salts are taken up by the blood and excreted, I may mention how Dr. Todd used to demonstrate this rapid action before his class at King's College, London, in the case of an unfortunate German, the orifice of whose ureter were exposed to view from absence of the anterior wall of the bladder. Dr. Todd used to give him three or four grains of iodide of potassium in solution to drink, and within sixty seconds, show by reagents the presence of iodine in his urine as it dropped from the orifice of the ureter.

Sham Lall Sepoy, aged 23 years, admitted 6th June with bilious Diarrhœa; no vomiting.

Pulv. Cretœ co. c. Opio., 2 scruples, with one grain of opium added, to be given immediately, and repeated every two hours.

By ten A. M. he was vomiting and purging rice-water; pulse very small and quick; respiration cold and laboured; severe cramps; suppression of urine; skin cold; great thirst; burning pain at the epigastrium.

Tartar emetic, 1 grain, to be given every fifteen minutes; and mustard sinapisms.

5 P. M.—Skin warmer; respiration also; cramps less; pulse, thirst, and burning pain much the same; vomiting and purging less.

One grain tartar emetic every half-hour.

Between 8 and 9 P. M. all the bad symptoms had increased, and the collapse became more profound than before.

The tartar emetic to be given every fifteen minutes.

7th.– 6 A. M. Surface slightly warmer. Continue the remedy.

At 7 A. M., on the 8th, five ounces of urine passed by catheter.

10 A. M.—Skin warmer; breath also; small blisters on the tongue; pain in the throat. He never rallied, and died at 6 P. M., having had Cholera symptoms for fifty-six hours, and having taken 180 grains of tartar emetic.

Sepoy Saween Sing, admitted at the same time, with similar symptoms, and exactly similar treatment, made a better rally on the evening of the 6th, but relapsed like Sham Lall within three hours after the frequency of the dose of antimony was reduced from fifteen to minutes, until he had taken altogether 166 grains; each time partial reaction occurred it was better marked than in the former case, and he finally recovered perfectly. Both men were strong, healthy, young Nepal Goorkhas.

It is worthy of remark that five ounces of urine were taken from the bladder of the man who died, eleven hours before. The man who lived passed no urine from 10 A.M. on the 6th to 9 A.M. on the 9th It was not suppression of urine that killed Sham Lall, the urine was fresh, he passed pure blood by stool on the 8th, his tongue was blistered, and his throat pained him.

The inflammation was never got under control and kept under control after the evening of the first day of admission; during that evening and night it gained ground. Probably there may have been some carelessness in administering the remedy during the night by the attendants, and though one or two more attempts at reaction showed themselves, they never lasted, and though the kidneys began to act, he died. Died from the destructive effect of the intense tissue action in the small intestines.

Case XIII.—In May, a camp follower was reported to have Cholera, he had all the symptoms, took twelve grains of tartar emetic and recovered.

Case XIV.—On the 21st July at 8 P.M., Doobee Sing, 22 years old, was brought into hospital with severe Diarrhœa. Ordered two grains of opium with aromatic chalk every two hours. By 10 P.M. he was vomiting and purging rice-water, pulse got small and quick, skin cold, breathing oppressed, severe cramps in legs and arms, great thirst and suppression of urine. Mustard sinapisms ordered every two hours to the epigastrium, and one grain of tartar emetic every fifteen minutes.

Reaction in six hours, tartar emetic every thirty minutes, in one-grain doses, for five hours. Passed urine at 6 A.M. on the 22nd, and was discharged well on the 26th.

Case XV.—A camp-follower was constantly vomiting and purging rice-water from 2 A.M. to 10 A.M., accompanied with severe cramp, suppression of urine, cold skin, &c. Ordered one grain antimon every fifteen minutes. He only took four doses when the vomiting and purging ceased, and reaction set in. He recovered.

Altogether I have related fifteen cases, treated on Antiphlogistic principles with tartar emetic; and out of the fifteen, three died: one from fear of pushing this "depressing" and "dangerous" remedy too far; one from having opium administered to him, for supposed Dysentery, after reaction had commenced; and one because the remedy was not continued long enough at first every fifteen minutes, and afterwards was not tolerated. In a case like this, which is sure to be met with every now and then, I should give one twenty-grain dose of calomel, to *quiet the stomach*, and then try the tartar emetic again. It is essential that the antimony be retained in great part, and taken into the circulation quickly, to ensure success.

I received the following letter from my friend, Dr. N. J. Grant, of the 11th Bengal Cavalry, at Allahabad, dated the 24th of June 1869:

MY DEAR BARNARD.—I have treated two cases of Cholera with tartar emetic, following implicitly your directions. One grain every fifteen minutes until the pulse and warm surface came; and then every hour; both successful, but I should say that they were not *very* virulent cases. However, from what I saw of the action of the antimony, I shall give it a further trial.

Yours sincerely,

N. JAMES GRANT.

These make seventeen cases and three deaths, and proves that others can be successful with my "controlling agent" as well as myself.

An out-break of Cholera of a very virulent type broke out in the jail and police lines in Shillong, on the 10th of July 1869, and Dr. Reed, the Civil Surgeon, after failure with calomel, agreed to give my Antiphlogistic treatment a fair trial, though he expressed a great prejudice against it. Dr. Reed told me that he had seen Cholera outbreaks in 1849, in 1853, in 1856, in 1858, in 1866, in 1867 and 1868, but that he never saw the disease so unamenable to treatment.

On the 16th, he wrote to me as follows: "The tartar emetic in the cases it has been administered, where it has not preserved life, has certainly mitigated the violence of the symptoms; and I have to mention a circumstance worthy of note, *viz.*, that when in one case reaction appeared to be well established, the tolerance of the remedy was lost, and it had the same effect on the patient as it would have had on a healthy man. I will not go so far yet as to say that it is the specific remedy, it is however worth an extensive trial." And again, in another note to me on the 18th, he says, "the tolerance of the tartar emetic is extraordinary, and reminds me of some cases of croup I have treated."

No doubt exists in my mind that antimony, as I give it, will hereafter be deemed as indispensable in the treatment of the Cholera inflammation as it is now in the inflammation of croup.

It will be remarked in reading through Dr. Reed's Synopsis hereto appended, that time was not kept, and that, falling short of tartar emetic, he resorted again to calomel, and that as he himself said to me, and insinuates in the accompanying letter, it was not a fair and satisfactory trial.

My Dear Barnard.—Herewith a synopsis of the cases of Cholera treated with tartar emetic:—

4 Recoveries.
1 Recovered from Cholera, but died afterwards of Acute Dysentary.
6 Deaths.
—
Total 11

The type of the disease was unusually severe, though those who died took a long time to do so.

The mortality under the tartar emetic treatment is not greater than I have seen under other remedies, and might, with a good staff of subordinates *and with good nursing*, be much less

That there is a wonderful tolerance of tartar emetic in Cholera. I can testify from my own observation, and I would recommend an extensive trial of the drug, which would settle the question of its value one way or the other.

Believe me, &c.,

A. K. REED.

Synopsis of Cases of Cholera treated with Tartrate of Antimony, in the Jail and Police Hospitals, Shillong, July 1869, *by* DR. REED.

Constable Munnoo Thappa, aged 28, came to Hospital, at 9 P.M., in stage of reaction; tongue still cold; urine suppressed; treated with counter-irritation to spine and epigastrium, and ordered one grain of tartar emetic every quarter of an hour. Took 31 grains. Recovered.

Constable Pooah Ram, aged 24, came from the Jail Guard at 9-30 A.M. Three congee stools and immediate collapse; counter-irritation to spine and epigastrium; ordered one grain of tartar emetic every quarter of an hour; the collapse became more profound, and he died at 4 P.M., having been totally insensible for some time. Took 15 grains.

15th July.—Constable Derriah Sing, aged 20, came from Camp Shillong at 3 P.M., complaining of burning pain in epigastrium; purging and vomiting (congee); slight spasm. Ordered tartar emetic, one grain, every quarter of an hour, counter-irritation, &c. Took in all 34 grains. Recovered.

15th July.—Ghasee Ram, aged 19, came at 6 P.M. on the 15th, with Diarrhœa. Had 40 grains Pulv. Cretœ c. opio, with one grain of opium, three times, which stopped the Diarrhœa; no suppression of urine then. 7 A.M.—Symptoms of Cholera, cold breath and sunk voice; urine suppressed. Tartar emetic, one grain, every quarter of an hour. Took 20 grains of tartar emetic. Died 16th July, 9-30 A.M.

16th July.—Motee Ram, aged 23, came from Jail Guard at 5 P. M. Two congee stools; vomited once; fell into profound collapse; cold breath; urine suppressed. Tartar emetic one grain every quarter of an hour. In all he took 15 grains tartar emetic. Died 16th July, 11-20 A.M.

16*th July.*—Nogaram, aged 19, came with Fever and Diarrhœa; the latter checked by Pulv. Cretœ aromatic c. opio, with a grain of opium added to each dose. He took a meal of rice, which brought on vomiting, followed by purging and collapse with spasm; sinapsims to spine and epigastrium. Tartar emetic, one grain, every quarter of an hour; reaction set in in about an hour.

17*th*, 6 A.M.—Body warm; tongue cold; urine suppressed; refused to take medicines. He took in all 25 grains. Died, 11 A.M.

14*th July.*—Prisoner Reong Kola, aged 28, came in from Road-working, with Choleraic Diarrhœa, which turned to Cholera at 11 A. M. The Diarrhœa has been checked by taking a few doses of chalk and opium as usual. 11 P.M.—Congee stools; tongue cold; retention of urine; vomiting. Calomel and soda given, and of ether and ammonia every other hour. Liquor lyttæ and mustard poultice. 7-3 A.M.—Complete collapse. At the request of Dr. Barnard, his remedy, tartar emetic, was exhibited. Tartar emetic one grain every ¼ of an hour. 10-30 A.M.—Had made water; reaction came on. He had had 40 grains of tartar emetic *when tolerance of the remedy ceased.*

15*th*, 7-30 A.M.—No relapse.

16*th.*—Convalescent. Vin: Ferri, Nitric Acid dil., *a a* m. 10.

20*th July.*—Recovered.

15*th July.*—Thama, a prisoner, aged 30.—7 A.M. Copious purging (congee), tongue cold; retention of urine; vomiting; collapse complete. Tartar emetic, one grain, every quarter of an hour. Rejected, afterwards tolerance; no improvement, no reaction, he gradually sunk. Died 15th July, 11 A.M.

16*th July.*—Syhumboo, prisoner, aged 20, had been in Hospital with Dysentery for sometime, much emaciated. 8 A.M.—Purging (congee) twice vomited; tongue cold; retention of urine; now collapse setting in. Tartar emetic, one grain, every quarter of an hour. 4 P.M.—Continued tartar emetic. Spasm has set in; no reaction. He continued to sink, and died at 9-30 P.M. on the 16th July.

16*th July*.—Alye, brought to hospital at 4 A.M. in a state of profound collapse; breathing cold; tongue cold; (congee) stools; retention of urine; vomiting;—sinapism to the epigastrium. Liquor lyttæ to loins. Tartar emetic, one grain, every quarter of an hour. He took 25 grains tartar emetic. Collapse became more and more profound. He died at 4 A.M. on the 17th July 1869.

16*th July*.—Purbut, aged 26, came to Hospital, at 10 A.M. in collapse; body cold; great thirst; purging congee; retention of urine; half an hour after, collapse profound. Tartar emetic, one grain, every quarter of an hour; mustard plaster on epigastrium, and liquor lyttæ on the loins. P.M.—Body warm, pulse soft and pretty full.

17*th July*—Body is warm, and he has had two or three offensive stools.

18*th*.—Passed urine; is very weak. Port wine and arrowroot.

19*th*.—Flow of urine natural, bowels free. Took 32 grains of tartar emetic, and is convalescent.

17*th July*.—Royee, aged 28, brought to hospital at 2 P.M.; skin cold; spasms; congee stools; retention of urine; vomiting;—mustard plaster as usual. Tartar emetic, one grain, every quarter of on hour; reaction came on very quick, and he made water in the evening. He took 20 grains of tartar emetic; after 2 days' convalescence, he was attacked by acute Dysentery, which carried him off in 36 hours. Died from acute Dysentery at 11-30, 21st July.

If three, four, five or six Cholera Hospitals were established in Bengal by the 1st of January next, and a different plan of treatment adopted in each; or one large Hospital in Calcutta with half a dozen wards and the different plans of treatment fully and fairly carried out, the results would be well shown by the time four or five hundred cases had been treated in each. The temperature, as taken and observed by Dr. Sutton of the London Hospital should be carefully observed, and registered from hour to hour, as well as the pulse and all the symptoms, and exact time of administration of remedies, age, sex, constitution, mode of life, residence, employment, condition, &c., of patients must be all duly noted.

Then the calomel men will have a fair chance, and the do-nothing-but-watch-and-nurse-men, and the eliminators and the brandy-and-wine-men, and I hope, my antiphlogistic treatment. I would have one set of patients treated with tartar-emetic and sinapisms and ices and iced water to drink alone, and another with the assistance of bleeding in the early stage of true Cholera symptoms. One set with ice and iced water to drink and sinapisms only. And of course in all cases hand-mulling to relieve cramp and other accessories more appertaining to the nursing than the doctoring.

Shillong, *20th September*, 1869.

Since going to press, Colonel Agnew, the Commissioner of Assam, observed to me, that all Dr. Reed's cases, who had taken over twenty-five grains of Tartar emetic, recovered.

This has since been confirmed by Dr. Reed himself.

A few days ago I received the *London Medical Times and Gazette*, for the week ending Saturday the 24th of July 1869, containing a report of the meeting of the Clinical Society, on Friday, May 28, 1869; Mr. Paget in the chair; from which I extract the following:

"Dr. Murchison related a case of Cholera, which had been treated by him, in the Middlesex Hospital, during the epidemic of 1866, by injection into the veins of a saline solution at a lower temperature than that of the blood. The patient, a pregnant woman, aged 43, was admitted in complete collapse of several hours' duration. She had cramps, vomiting, and whey-like alvine discharges, which had first come on nine hours previously, the diarrhœa having existed more or less for several days. As no improvement resulted from other treatment, exceptng in so far that the vomiting and purging had ceased, it was resolveid (five hours after her admission) to have recourse to saline injection, the patient being still profoundly collapsed, and having a temperature of 96·8° in the axilla, and 100·2° in the rectum. The process of injecting lasted forty-five minutes, the quantity used being two pints. Its temperature was not more than 100° at the beginning of the operation, and no means were used to maintain it. By the time that half the quantity had been introduced, the pulse, which was before imperceptible, became distinct, the breathing easier, and the countenance more natural. The improvement, however, was transitory. No sooner was the injection completed than the watery evacuations returned with greater violence, and shortly afterwards the patient subsided into a state of more profound collapse than before, still retaining consciousness, asking for food. She died two hours and-a-half after the injection. Dr. Murchison, in commenting on the case, indicated its bearing on the views entertained by a well-known physician as to the pathology and treatment of Cholera, who attributes the extraordinary effects of saline injections in restoring patients for a time from collapse to the high temperature of the liquid injected. In the present case, the effect could not be due to its temperature. He also pointed out that the subsequent relapse was *preceded by purging*, from which circumstance he thought it might be inferred that there was a closer relation between watery evacuations and the algid state than some persons were willing to admit.

"Dr. Murchison further related a case of Gastro-enteritis from local irritants, simulating Cholera, and occurring twice in the same individual. The patient, a woman, aged 51, was admitted into the Middlesex Hospital, on April 10, 1867, suffering from vomiting, purging, and cramps, which had come on suddenly, and had lasted for the preceding fourteen hours. When first seen she was collapsed, the pulse being almost imperceptible, and the axillary temperature 96·8°. These symptoms gradually subsided, *no urine*, however, being passed *for the first thirty-six hours.* In a few weeks she was dismissed convalescent, but on July 23 was again admitted with similar symptoms—viz., watery evacuation, cramps, *suppression* of *urine*, followed by temporary albuminuria and collapse, which subsided gradually, as before, under appropriate treatment. The first attack was apparently brought on by partaking of cheese in an unusually decomposed state, the second by eating a preserved lobster. Dr.

NOTE.—The italics are mine.

Murchison proceeded to observe that the completeness of the correspondence between such cases as the one he had related and those of Cholera appeared to him to afford a further confirmation of the opinion he had already expressed, that the condition of collapse is brought about in exactly the same way in Cholera as in the Gastro-enteritis, which is produced by certain irritant poisons; in short, that in both cases it is a consequence of the profuse discharge of liquid from the intestinal mucous membrane.

"Dr. Greenhow said a lady took half a drachm of croton oil by mistake. Sickness and purging followed. Two hours after she was exactly as in a state of Cholera collapse; he would have said she was suffering from Cholera, and she died in ten hours.

"Dr. Symer Thomson said that the observations as to salines recalled to his mind a conversation with Dr. Stevens, who was so fond of them. He considered temperature to be a matter of little importance. They might give rise to a return of the evacuation, but there was no reason for leaving them off.

"Dr. Church had only once seen salines used; latterly the temperature must have been below 100° Ft. Whatever was the cause of Cholera, he believed gastric irritation to be the prime cause. During last epidemic a man in St. Bartholomew's Hospital, who had gone through the crisis of the disease, fell back and died, apparently from having eaten two imperfectly boiled potatoes.

"Dr. Greenhow said they must endeavour to separate the true cause from any error of diet. He remembered, in 1852, certain cases brough on by aperients.

"The Society then adjourned till Friday, October 8."

Finally, I submit the following definition of Cholera Maligna:—

An acute specific inflammation, commencing in the villi of the mucous tissue of the small intestines; generally spreading upwards into the larger curvature of the stomach; sometimes in prolonged cases into the ascending colon; in uncontrolled virulent cases extending to the submucous connecting tissue, involving Peyer's and Brunner's glands in the general destruction of the tissue, caused by the immediate presence in the chyle, of a poisonous invisible fungus that has escaped the action of the gastric fluid; *indigenous* to Bengal, feeding in air and water on (the poison that causes typhoid) decomposing invisible atoms of human excrement.

CALCUTTA:—PRINTED BY THACKER, SPINK, AND CO.